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ABSTRACT

To examine the utility of the "Systematic Self-Reflection" (SSR) process, a study investigated the effects of three levels of self-reflection--systematic, focused, and random--on problem solving and efficacy in 62 elementary school teachers. The study examined the application of four components of a problem-solving model (problem identification, goal setting, intervention selection, and monitoring and evaluation), and compared the self-reports of teachers on their choice of intervention strategies for students and their reflections on the problem-solving techniques used to select intervention strategies. The systematic participants (n=25) were the only ones to use a rubric defining the problem-solving model to analyze their own self-reports of intervention selection. Their ability to apply the problem-solving model was compared to two other groups of teachers: the focused group (n=17), who received the same professional development workshop but not the rubric; and the random group (n=20), who received neither the rubric nor the professional development workshop. Study results indicated that the systematic participants exhibited significantly higher levels of problem-solving model application in both their self-reports and their reflective journals. They were the only group to set goals for their students and then select interventions to match those goals. These participants also exhibited a deeper understanding of the problem-solving model in their reflective journals. The most striking finding was the emergence of a common language for problem-solving among the systematic practitioners. (Contains 71 references.) (ND)

Systematic Self-Reflection: Professional Development for the Reflective Practitioner

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In the 1980s widespread dissatisfaction with conventional modes of "staff development" began to surface (Fenstermacher & Berliner, 1983; Huberman, 1995; Wade, 1985). When researchers sought to verify the enduring effects of one-shot in-service training delivered with little help or follow-up from a long-term consultant, few remaining traces of content were found (Daresh, 1987; Murphy & Hallinger, 1993).

Educational researchers may have fundamentally contributed to destructive practices in teacher preparation, since the way in which researchers framed teacher learning inevitably colored both the questions they chose to study and the resulting educational models they encouraged. By viewing the process of learning to teach as acquiring subject matter skills and procedural routines, educational researchers focused primarily on the relationships of observable teacher behaviors with student achievement to the relative exclusion of the mental processes that support teacher behavior (Armour-Thomas, 1989; Grossman, 1992). This behaviorist framework led to the "...atomistic view of effective teaching that emerged from process-product research" (Kagan, 1990, p. 419), and led to the belief that teacher competencies could be defined entirely in terms of lists of behavioral objectives (Howey & Zimpher, 1989) and/or frequency counts during a classroom performance (Stodolsky, 1984). Goodlad (1990) concluded that this framework resulted in "training how to do it, rather than why to teach in a given way---the 'technification' of teacher education" (p. 234).

In his plea for a shift to a broader view of professional development Michael Huberman (1995) demonstrated that the very language used to describe the process of teacher education contributes to the restrictive view of teachers. This restrictive view was bolstered by the perceptions of "outside experts...[who] often viewed teaching as technical, learning as packaged, and teachers as passive recipients of the findings of 'objective research'" (Lieberman, 1995, p.592). Although it is theorized that professional development focused on facilitating teacher self-reflection is superior to past teacher education practices, the theory seems to have minimal impact on existing in-service programming. It is argued that the dominant mode of teacher education still focuses on staff development that is formal in nature, unconnected to classroom life,

and pays little attention to the metaphor of the teacher as a learner (Darling-Hammond, 1996; Guskey & Huberman, 1995; Hargreaves & Fullan, 1992; Lieberman, 1995). A clear need exists for research-based models of reflective professional development.

The primary goal of this study was to investigate the effects of self-reflection on teachers' ability to apply a problem solving model and on teacher efficacy. At issue was the utility of a professional development model that viewed the teacher as an active and engaged learner. The model utilized a process of *Systematic Self-Reflection,* to be discussed shortly, to support teacher acquisition and application of new knowledge. During *Systematic Self-Reflection* teachers employed the educational language of a self-reflection rubric to continuously and systematically filter reflections and reconstruction of knowledge. The secondary goal of the study was to examine the resulting effects of differing levels of self-reflection on reported teacher efficacy for choosing intervention strategies to use with students.

Educational Language as a Cognitive Tool Vygotsky's (1978) *zone of proximal development* can be used to explain the power of educational language to shape teacher thinking and to promote self-directed teaching by developing higher psychological processes (Manning & Payne, 1993). In Vygotsky's view, knowledge is constructed socially and collaboratively through substantive conversation---verbal interaction with a more experienced person provides the mechanism for learning and growth. For teachers, this experienced person could be a supervisor, teacher educator, or peer who possesses greater expertise in a certain area or program. Of primary importance to the teaching process is the impact of educational language as a cognitive tool. Specifically, educational language---first as used by others and then as used by the teacher---can direct and regulate thinking in order to transform new knowledge from an external event to an internal construct. During this process, the educational language scaffolds teacher learning until it becomes self-regulated and free standing thus bridging the gap between the teacher's current abilities and

intended goals (Palincsar & Brown, 1984; Paris, Wixson, & Palincsar, 1986; Smagorinsky, 1995; Wood, Bruner, & Ross, 1976). These scaffolds provide support that is both temporary (Tobias, 1982) and adjustable, and allows the teacher as learner "to participate at an ever-increasing level of competence" (Palincsar & Brown, 1984, p.122).

If this view of teacher as learner has merit, it follows that professional development could promote reflectivity rather than impulsivity in teachers through the conscious use of educational language between a classroom situation and a teacher's response. Teacher self-talk, verbal mediation filtered by professional language, engenders and encourages self-regulation in two ways. First, the time it takes to talk to oneself puts distance between the classroom event and the teacher action. This time factor promotes teacher responses that are more conscious and more controlled. Second, the semantic element of what teachers say to themselves prior to an act can influence the outcome of that act if the verbal mediation includes the filtering of meaning and attention through the semantics or meanings of words as representations (Manning & Payne, 1993). Consequently, the goal of professional development should not be teachers who simply reflect or employ self-talk; but rather self-directed teachers who employ educational language to transfer guidance by others to self-guidance. The goal of professional development should be self-regulated teachers who employ a rich and developed professional language to filter reflections about their thinking, understanding, and practice.

Cognitive Characteristics of Expert Teachers Effective thinkers share identifiable characteristics (Feuerstein, Rand, Hoffman, & Miller, 1980; Larkin, 1981; & Sternberg, 1985) among which are mental habits that characterize expertise: seeking accuracy and precision; being sensitive to feedback; persisting to find a solution; and avoiding impulsivity of thinking (Costa, 1991; Ennis, 1987; Flavell, 1976; Marzano, 1992; Paul, 1990; Perkins, 1984). Equally important, a combination of self-reflection, planning, and evaluation of the effectiveness of one's actions is essential to render one's thinking and actions more effective and self-regulated (Brown, 1978; Flavell, 1977).

Investigations of the differences between expert and novice teachers have characterized expert teachers as having highly organized knowledge structures for teaching (e.g., Borko, 1989; Carter, Sabers, Cushing, Pinnegar, & Berliner, 1987; Leinhardt & Greeno, 1986).

The language teachers use is an essential element of expertise. Peterson and Comeaux (1987) used the structure, themes, and schema of teacher language to support claims of strategic thinking and established a link between teacher language and levels of expertise relative to self-reflection. Differences in teachers' recall, representation, and analysis of classroom problem situations provided evidence that expert teachers had significantly greater recall of classroom events than novice teachers. Of special significance to the present study was the finding that experienced teachers used language to discuss alternative decisions that suggested richer knowledge of underlying structure and schema than did novice teachers. These comparatively more complex understandings of the teaching process assisted experienced teachers in accurately perceiving and appropriately responding to interactive teaching events. The contrast between the number, richness, and flexibility of the schema they bring to the classroom setting differentiates the reflective practice of experts from the routine practice of novices (Schon, 1991). This identifiable contrast supports a model of professional development that seeks to foster self growth in cognition through reflection and self-analysis (Sparks-Langer & Colton, 1991).

Elements of Teacher Self-Efficacy Teacher self-efficacy appears to consist of two dimensions. Dimension one concerns the teacher's generalized expectancy of his or her ability to influence student behavior. For example, the teacher may see certain external factors such as home environment, parental support, or family history as limiting their ability to significantly impact a low-achieving student. Dimension two concerns the teacher's belief in his or her own ability to perform specific tasks. For example, a teacher may believe in the value of alternative methods of classroom assessment but doubt his or her own ability to accurately design or carry out this type

of assessment process (Bandura, 1977; Dembo & Gibson, 1985; Gibson & Dembo, 1984, Kagan, 1990).

The belief systems of individual teachers and collectively of a faculty, create school cultures that can have either vitalizing or demoralizing effects on how well schools function as a social system (Brookover, Beady, Flood, Schweitzer, & Wisenbaker, 1979; Good & Brophy, 1986; Purkey & Smith, 1983; Rutter, Maughan, Mortimore, Ouston, & Smith, 1979). Teachers with high perceived coping efficacy, for example, managed stressors by directing their efforts to resolving problems. In contrast, teachers who distrusted their efficacy tried to avoid dealing with academic problems and instead turned their efforts inward to relieve their emotional stress (Chwalisz, Altmaier, & Russel; 1992). By way of illustration, consider a teacher faced with a disruptive or noisy student. A teacher with high perceived coping efficacy might focus efforts on identifying, implementing, and monitoring the effects of specific interventions to redirect behavior. However, a teacher who distrusted their efficacy might instead focus efforts on identifying factors that limit their ability to redirect the behavior such as lack of discipline at home or lack of support from the principal. Clark & Peterson (1986) found that teachers who did not expect to succeed at a particular task (teaching a specific content or model, or working with a challenging student), were unlikely to persist at the task and/or attempted to avoid that task in the future. In contrast, individual teachers with relatively stable and consistent efficacy attributed classroom success to their own skill and ability as teachers, and predictably continued to expect success with future classes of students (Pintrich, 1990). Gibson & Dembo (1984) argued that a teacher's willingness to continue to intervene with a student in a failure situation was indicative of the teacher's confidence in her teaching ability and/or in the student's ability to learn.

Systematic Self-Reflection The current literature supports the argument that professional learning should endeavor to understand how meanings are constructed and interpreted by the individual and how metacognition can assist the teacher to

develop powerful inner language to guide continuous self-improvement (Darling-Hammond & McLaughlin, 1995; Fenstermacher, 1988; Gallimore, Dalton, & Tharp, 1986; Lieberman, 1995; Manning & Payne, 1993; McKibbin, 1978-1979; Neely, 1986; Payne & Manning, 1988; Ross, 1989; Simmons, Sparks, Starko, Pasch, Colton, & Grinberg, 1989; Szykula & Hector, 1978; Sparks-Langer & Colton, 1991). Processes used to deliver professional learning opportunities should reveal not only pedagogical problems but should also develop ways of thinking about those interactions supported by teachers' practice of and reflection on precise problem-solving models and schema. The design of these professional learning opportunities should combine both context and thought---that is to say, this learning should be situated in the actual classroom of the practitioner and support the teacher's actual practice.

The present study examines the effects of a model of professional development based on the process of systematic self-reflection (Figure 1).

Insert figure

This process utilizes the precision of educational language organized as a performance rubric. Teachers use the rubric to filter their self-reflection concerning their present levels of thinking, understanding, and practice during a continuous and strategic process. Initially, teachers employ the rubric to prime self-reflection and promote self-assessment to detect gaps in present levels of thinking, understanding, and practice. Next, teachers use the language of the rubric to scaffold the design of a heuristic for new levels of thinking, understanding, and practice. As the heuristic is applied, the rubric aids teachers in monitoring progress toward newly identified outcomes for their thinking, understanding, and practice. Finally, teachers filter experiences resulting from application of the new heuristic through the lens of the rubric. In this final stage of the process, teachers expand their knowledge base and subsequently trigger an assessment of the resulting new levels of thinking, understanding, and practice to once again detect and mend any gaps. The systematic-self reflection process---continuous, strategic, and reconstructive---utilizes the cognitive tool provided by the

educational language of the rubric to mediate learning, aid in reflectivity, and serve as a bridge between present ability levels and future goals.

Method

To examine the utility of the Systematic Self-Reflection (SSR) process, the present study investigated the effects of three levels of self-reflection, represented by three groups of practicing teachers: *Systematic*, *Focused*, and *Random*, on problem-solving and efficacy in practicing teachers. Comparison among the groups explored the application of four components of a problem-solving model: a.) problem identification, b.) goal setting, c.) intervention selection, and d.) monitoring and evaluation. Self perceptions of efficacy were measured and comparisons among the groups of teachers were made.

Participants Practicing teachers were solicited from three elementary schools in one western Pennsylvania intermediate unit. An intermediate unit is a regional education service agency which acts as a liaison between the Pennsylvania Department of Education and the local school districts.

The three elementary schools each had an Instructional Support Team (IST) in accordance with the guidelines of the Pennsylvania Department of Education (Kovaleski, 1994). Solicitation took place during faculty meetings at each site with all members of the teaching faculty given equal opportunity to participate in the study. Because logistics of public schools prevented the random assignment of individual teachers to one of three treatment groups, the volunteer teachers at each site became a separate group for the study. The total number of participants (N=62) comprised three groups: *Systematic* (n=25), *Focused* (n=17), and *Random* (n=20).

Procedures Figure 2 presents a treatment schema for the three participant groups.

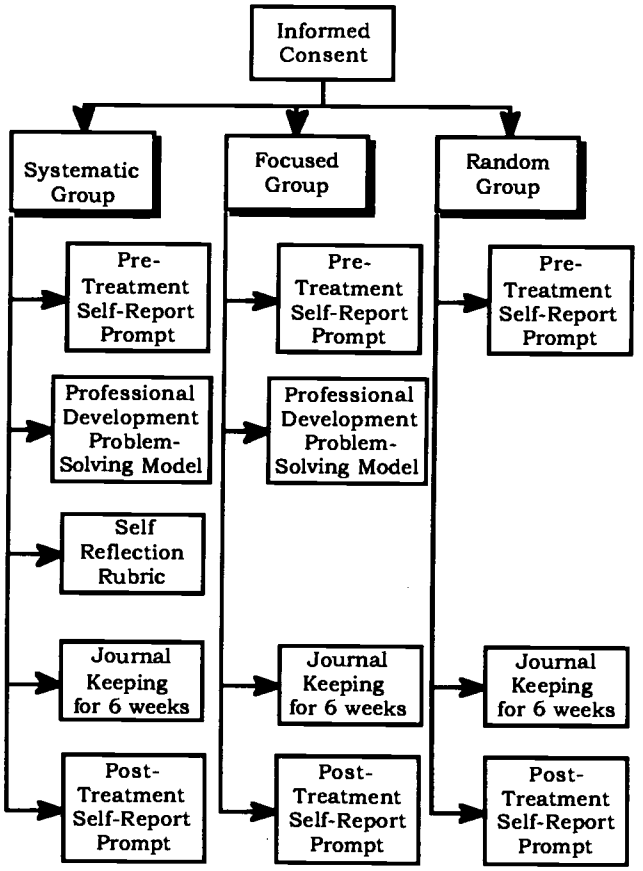

Figure 2. Design of the study to test the effects of Systematic Self-Reflection on teacher problem-solving and efficacy.

The Pre-Treatment Self-Report Prompt. Participants in all groups responded to the following open-ended statement on the pre-treatment self-report prompt :

> *"Think of a specific student in your classroom who is experiencing difficulty. For the next 15 to 20 minutes write a description of the student highlighting your areas of concern and any steps you have taken to intervene with the student. Include the effects or results of your intervention if any. Include any background information that is important."*

This open-ended wording was designed to decrease the chances for any additional stimulus to become a plausible cause for a given response (Nisbett, & Wilson, 1977). It was piloted over a two year period with 350 educators (Moss, 1996). The open-ended wording allowed participants to draw upon actual experiences in their classroom and

in reporting their decisions and actions, reveal their framework or lack of framework for problem-solving, and expose factors they considered vital to the solution. Such thoughts are often situated in specific classroom events and occurrences, and are associated with particular students (Leinhardt, 1990).

In addition to the open-ended statement, the self-report prompt contained a six-point forced choice (c.f., Popham, 1993) Likert scale to determine the participant's confidence level for their selected intervention. The scale ranged from choices of *Extremely Confident* to *Extremely Unconfident.*

Professional Development Workshop. Immediately following completion of the pre-treatment self-report prompt the *Systematic* and *Focused* groups received comparable three and a half hour professional development workshops on the problem-solving model. The workshops were delivered at each site by the researcher as part of her normal consultation duties. To guarantee comparable experiences during all workshops, identical tasks, handouts, and instructions accompanied the delivery of identical content. Each workshop was documented against a workshop experience control checklist which provided a running narrative outline including exact wording of spoken directions, detailed descriptions of activities, and exact time frames/sequences. Building principals and/or support teachers at both sites monitored the workshops by initialing each section of the checklist immediately after each activity was completed as described. A comparison of the checklists yielded no differences.

The Problem-Solving Model. The problem-solving model used in the study was based on a collaborative model for instructional assessment used by the Instructional Support Team (IST) Project of Pennsylvania (Idol & West, 1991; Kovaleski, Lowery, & Gickling, 1995). The documented use of this collaborative model over a five year period yielded reduced numbers of students identified for special education services and/or retained in grade (Kovaleski, Tucker, & Duffy, 1995).

The problem-solving model requires authentic assessments of students using actual classroom materials. It comprises four critical components: a.) problem

identification---which requires that a specific problem for a student be clearly defined in observable measurable terms, and analyzed with reference to existing curricular, instructional, student, and environmental variables within the specific setting and context of the particular classroom; b.) goal setting---which requires a goal described in observable and measurable terms including a description of the variables to be manipulated in a systematic search for success for the student; c.) intervention selection---which requires an intervention to be directly related to the stated goal and able to be monitored using simple statistics such as frequency, percentages, intensity, and duration; and, d.) monitoring/evaluation---during which the ongoing effect(s) of the intervention is monitored and evaluated providing corrective feedback data to inform decisions and devise modifications to the intervention as necessary (Kovaleski, 1994).

Professional Development Materials. All materials were selected, adapted, and designed by the researcher in accordance with the IST Project training manual on collaboration (Kovaleski, 1994) and refined over a 4 year period of consultation and technical assistance to elementary schools involved in the Instructional Support Team Project.

Systematic Self-Reflection. During the workshop, each component of the problem-solving model was presented and discussed in turn. One critical process differentiated the experience of the *Systematic* and *Focused* groups. After the introduction of each component, *Systematic* participants were asked to analyze their written response to the open-ended statement of the self-report prompt against the specific criteria of the self-reflection rubric. For example, after discussion of characteristics of precise problem identification, *Systematic* participants assessed their written response for the existence and precision of their problem identification statement. *Focused* participants, on the other hand, did not receive the self-reflection rubric, and instead were asked to apply the problem-identification component to vignettes describing students experiencing classroom difficulties.

The Self-Reflection Rubric. The rubric design was analytical and comprised a four-point criterion scale. The rubric encouraged *Systematic* participants to consider their written response with reference to the four components of the problem solving model. The rubric provided diagnostic information on performance levels using descriptive terms for differences in degree of performance constructed to indicate gradation of understanding as evidenced by quality of application of each component (McTighe, 1996). A top score of 4, the highest level of the performance, indicated through or complete understanding and application; 3 points indicated substantial understanding and application; 2 points indicated partial or incomplete understanding and application; and 1 point indicated misunderstanding, misconceptions or absence of application.

Drafts of the rubric were piloted over a two year period with 286 practicing teachers (Moss, 1996). The final format of the rubric incorporated suggestions for refining the content, language, and layout proposed by IST consultants who reviewed and critiqued each draft.

Self-Reflection Journals. During the last 10 minutes of the workshop, participants in the *Systematic* and *Focused* groups received individual journals. *Random* participants---who did not participate in a workshop--- received their journals immediately after completing the pre-treatment self-report prompt (see Figure 2). Participants from all three groups made one weekly journal entry each week for a total of six entries in six weeks. Participants were instructed to record their use of problem-solving methods relative to intervention selection for students experiencing difficulties in their classroom.

Post-Treatment Self-Reflection Prompt. At the end of the six weeks of journal keeping, each group of participants met for a 20 minute faculty meeting in their building. At this meeting the building support teacher presented the participants with the post-treatment self-report prompt containing the identical open-ended statement and confidence xcale used in the pre-treatment self-report prompt.

Data Analysis The three participant groups---*Systematic, Focused,* and *Random* reflection groups, were compared on both quantitative and qualitative data. Quantitative data were obtained by examining the self-report prompts (both pre and post treatment) using the self-reflection rubric and the self-confidence scale. The qualitative data for the self-reflection journal entries were analyzed through the use of a journal analysis checklist matrix. Each data source is described briefly below.

Scoring of Self-Report Prompt Narrative Responses. The analytic design of the self-reflection rubric offered particular utility for the process of evaluation by external scorers (McTighe, 1996). Ten raters, support teachers with the IST project, analyzed the self-report prompts against the criteria of the self-reflection rubric. To establish inter-rater reliability, raters participated in a two and a half hour orientation session which included reviewing both the workshop materials used during the professional development and an information packet on rubrics in general and the self-reflection rubric specifically. The raters agreed not to: a) judge one response by another; b) equate response length with quality; c) let handwriting, spelling, or grammar influence scores; d) let the participant's selection of a particular level of confidence influence their rating; or, e) be swayed by "cute" or "creative" responses. Raters agreed to remain focused on the criteria identified by the self-reflection rubric.

An inter-rater reliability of 83% was established during practice scoring rounds using pilot study response sheets. Raters agreed by + or - 1 point 92% of the time with less than 5% of the ratings differing by 2 or more points. During actual scoring, raters evaluated a random mixture of pre and post treatment self-report prompts. After 30 minutes of individual scoring, the inter rater reliability showed a 1 point agreement 96% of the time with less than 5% of the ratings differing by 2 or more points. During the remainder of the scoring session, raters periodically checked their scoring against one another.

Self-Reflection Journal Scoring. The researcher developed a descriptive checklist matrix to aid in the analysis of the journal entries. The matrix afforded the opportunity to systematize, verify, and quantify the narrative responses and permitted

direct quotes, frequency counts, and ratings to be kept together so "...their mutual pertinence [could] be assessed" (Miles & Huberman, 1994, p. 109). The matrix coded statements from the journals into three categories: a) themes/statements of efficacy, b) evidence of problem-solving model application, and, c) statements of effects on student(s).

A convenience group of three instructional support teachers, selected from the ten raters who had previously scored the narrative responses in the self-report prompts, served as a comparison group for utility of the scoring matrix. Each rater analyzed nine journals chosen at random from the 62 journals in the study. The random selection yielded a sample of 24 different journals with three of the journals analyzed by two raters. Each rater received 90 minutes of scoring orientation to learn specific category definitions and procedures. Comparisons of the completed matrix sheets from the three raters and the researcher supported the utility of the matrix design. In compared matrixes there were an equivalence of entries evidenced by comparable frequency counts, exact agreement on some supporting examples, and agreement on intensity judgments. This evidence supported the contention that the matrix afforded the collection of comparable data from the journals and entered it in "...a prespecified format... [to] express and test implicit ideas" (Miles & Huberman, 1994, p. 105).

The journal analysis checklist matrix was used to order the qualitative data of the journals following the format and procedures outlined in the rater orientation for the comparison raters. The descriptive journal analysis matrix employed direct quotes, frequency counts, and intensity judgments. During the ordering of the data, the researcher kept a running log of procedural steps, decision rules, and conclusions for emerging patterns that were not anticipated in the matrix itself (Miles & Huberman, 1994).

Results

The major research questions were analyzed via one-way ANOVA's.

A Levene's Test for Equality of Variance was conducted for each ANOVA because of the unequal sample sizes: *Systematic* group (n = 25), *Focused* group (n = 17), *Random* group (n = 20) and because each of the three groups represented teachers from different schools in different districts. The Levene's analysis yielded findings of homogeneity for several comparisons. Because a lack of homogeneity existed, Kruskal-Wallis analyses were performed. When compared with the one-way ANOVAs, the patterns of significance for the one-way ANOVAs and the Kruskal-Wallis were identical. Because this identical pattern of significance verified the robustness of the ANOVA procedure, *F* ratios were used to report quantitative results. Additionally, the effects of systematic self-reflection were tested against multiple dependent measures raising the potential problem of "probability pyramiding" (Huberty & Morris, 1989, p. 306). For this reason a Bonferroni correction was made and the experiment-wise alpha level was set at the very conservative level of significance of .0125.

Planned comparisons conducted on each dependent variable of the problem-solving model used the *Scheffe* procedure with a per-comparison alpha level of .05 to evaluate all a posteriori contrasts among means, since it is conservative in nature and "...robust with respect to nonnormality and heterogeneity of variance" (Kirk, 1982, p. 121). To further enhance the interpretation of the data, outcome variable intercorrelations were computed for the post-response set of analyses (Huberty & Morris, 1989).

Application of the Problem-Solving Model The first major research question addressed the effects of systematic self-reflection on the application of a problem solving model investigated through the model's four dependent variables: problem identification, goal setting, intervention selection, and monitoring/evaluation. Separate one-way ANOVAs performed for each of the four dependent variables did not significantly differentiate the teachers by group on the pre-treatment data: problem-identification, $F(2,59) = 1.08$, $p = .35$; goal-setting, $F(2,59) = .78$, $p = .46$; intervention selection, $F(2,59) = .1.65$, $p = .20$; and, monitoring/evaluation, $F(2,59) = .80$, $p = .45$.

In contrast, separate one-way ANOVAs performed on the four problem-solving model component post treatment scores yielded significant differences between the three treatment groups (Table 1). Significant *F* statistics were followed by post-hoc contrasts.

Table 1
Means, Standard Deviations and Results of the One-way ANOVAs for the Dependent Variables

	Treatment Groups						
	Systematic (n = 25)		Focused (n = 17)		Random (n = 20)		
Dependent Variables (Problem-Solving Model Components)	**M**	**SD**	**M**	**SD**	**M**	**SD**	***F* (2,59)**
Problem Identification	2.44_a	.183	1.65_b	.170	1.55_b	.154	8.57*
Goal Setting	2.00_a	1.04	1.06_b	.243	1.00_b	.000	15.50*
Intervention Selection	2.84_a	.851	1.76_b	.437	1.55_b	.510	25.12*
Monitoring/Evaluation	2.12_a	.927	1.94_a	.899	1.35_b	.489	5.35*

* $p < .0125$

Note: Means sharing a common subscript are not significantly different by the *Scheffe* test.

Problem-Identification. *Post hoc* comparisons on post-treatment problem identification scores from the self-report prompt indicated that *Systematic* participants, those who employed systematic self-reflection (SSR), evidenced significantly higher levels of problem-identification than participants from either the *Focused* or *Random* groups which did not differ significantly from each other. *Systematic* participants were judged to use statements which contained more precise descriptions of problems. Furthermore, *Systematic* participants identified the problem in observable, measurable terms with greater frequency, and were more likely to examine the problem with reference to curricular, instructional, student, and environmental variables. *Systematic* participants were also more likely to set the identified problem in context describing it with reference to before and after events. Non-pairwise comparison of the *Systematic* and the *Focused* participants (M = 2.04) indicated that teachers who participated in the problem-solving workshop had significantly higher mean scores on

the dependent variable of problem-identification than teachers in the *Random* group who did not participate in the problem-solving model workshop.

Analysis of the journal entries via the descriptive journal analysis matrix isolated evidentiary statements to support the quantitative analysis of the post-treatment self-report prompt (Table 2) The *Systematic* journals contained problem identification statements that described student behavior in more precise, observable and measurable terms. Furthermore, these problem statements were set in the context of a specific classroom event, activity, or task. In contrast, journals of those in the *Focused* and *Random* groups contained statements that addressed student concerns but frequently lacked clear problem identification statements. *Focused* and *Random* journal descriptions of student behaviors were less precise and more often lacked supporting details of context, frequency, or intensity. Moreover, *Focused* and *Random* problem identification statements were less observable or measurable. The accuracy level of *Focused* and *Random* problem identification statements was not easily differentiated when journal entries from these two groups were compared (Table 2), supporting the post hoc contrast results.

Table 2
Summary Table of Evidentiary Problem-Identification Statements by Treatment Group

Evidentiary Statements from Systematic Participant Journals
"Working independently ___ cannot alphabetize 5 groups of 3 words each using the second letter in the words, in ten minutes. Accuracy is zero."
"___ has difficulty sharing in a cooperative learning group. In less than five minutes _____ is fighting (arguing, name calling) with the members of his group."
"...during morning independent reading activity ___ was out of seat and at my side six times in a five minute period. He asks questions, makes comments, talks about unrelated topics".
Evidentiary Statements from Focused Participant Journals
"___ is bothering and annoying other children."
"A boy is having difficulty with computer files."
"Having a problem with social aspects of belonging to a group"
Evidentiary Statements from Random Participant Journals
"Poor organizational skills"
"Child is sluggish".
"Not able to stay in seat for more than a few minutes."

Goal Setting. The *post hoc* comparisons of post-treatment goal-setting scores indicated that *Systematic* participants employed significantly higher levels of goal-setting than *Focused* or *Random* participants, who did not differ significantly from each other. *Systematic* participants were more likely to set goals directly related to the identified problem and clearly described in terms of what the student needed to do or stop doing. In addition, *Systematic* goal statements described behaviors that were more likely to be observable and measurable and described with reference to curricular, instructional, student, and environmental variables in particular settings/contexts. The non-pairwise comparison of the *Systematic* and *Focused* participant scores (M = 1.53) with the *Random* scores indicated that teachers receiving the problem-solving workshop had significantly better goal-setting use than the *Random* teachers who did not receive the problem-solving workshop.

Systematic participants were the only participants to include goal-setting statements in their journals. None of the reflective journals from the *Focused* or *Random* participants contained a goal statement. This finding was significant. Although both *Systematic* and *Focused* participants received professional development concerning the importance of goal setting, only *Systematic* participants evidenced goal setting in their reflective journals. Fifteen participants (60%) in the *Systematic* group (n=25) included one or more goal statements in their journal. These goal statements ranged in quality. Some were accurate, observable and measurable, set in context, and directly related to the problem-identification statement. For example, one teacher wrote: *"During reading time he will raise his hand before speaking without being reminded by the teacher 90% of the time"*. Medium level goal statements were still observable and measurable, although less precise and not set in context. For example: *"Raise hand before speaking"*. Low quality goal statements contained vague descriptions, were not stated in observable, measurable terms, and were not defined in context. Example: *"To feel pride in his work and in himself"*. It is important to note that goal setting statements also ranged in quality within an individual journal and among participants in the *Systematic* group.

Intervention Selection. The results of the *post hoc* pairwise comparisons, as indicated in Table 1, on post-treatment intervention selection scores indicated that *Systematic* participants were judged to be more accurate in their intervention selection than both the *Focused* and *Random* participants who did not differ significantly from each other on their ability to chose accurate interventions. *Systematic* participants chose interventions that were directly related to the goal set for the student. Moreover, the interventions chosen by *Systematic* participants were monitored employing simple statistics such as frequency of the appropriate student behavior, percentage of correct responses, or duration or intensity of the behavior.

The non-pairwise comparison of the *Systematic* and the *Focused* groups differentiated them significantly from the *Random* group (M = 2.30), indicating that all participants receiving the problem-solving workshop had significantly higher qualities of intervention-selection statements than the *Random* group participants who did not receive the workshop.

Analysis of the intervention statements in the journals lent considerable support to the effects of Systematic Self-Reflection on the selection of intervention strategies for students. Only the journals of the *Systematic* group, the group who used Systematic Self-Reflection, contained goal statements. For one teacher, the goal "*To finish all assigned work—80% done in school*", was accompanied by the following interventions: "*Work alone in a quiet area. Work with a senior citizen 3 times per week. Have work signed by parents and returned. Do assignments on the computer*". The interventions described in the *Focused* and *Random* group journals could not be judged for accuracy of relationship to a goal, since no goals were mentioned in the journals of participants from either group.

Of particular interest was the resulting level of transfer of interventions (Gagné, 1985) selected by *Systematic* group participants. *Systematic* interventions were more often designed to take place in the student's classroom and were more often student-centered. Interventions described by the *Systematic* group were specifically focused on activities, strategies, and skills that the student needed to use

providing near transfer of the desired skills. For example, in order to encourage a student to do her best quality work and avoid rushing through her assignments, one teacher prescribed: *"Have her redo incorrect problems; give her praise for completing work correctly; give her reminders to slow down, proofread, etc.; reduce the number of problems on a page. Incorporate a sticker system into reading and math work."*

In comparison, in their reflective journals *Focused* and *Random* participants selected interventions that were often far removed from the stated problem and incorporated practices and procedures that established low transfer paths for skills (Gagné, 1985; Salomon & Perkins, 1989). For example, a *Focused* participant described a girl who *"blurted out"* while the teacher was teaching. As an intervention strategy the teacher decided to: *"...tell her I don't like this."* Similarly, a *Random* participant described a student who could not behave in the classroom and chose for the intervention: *"I will talk with the child's mother about school rules."* This pattern of low transfer interventions appeared with greater frequency in both the *Focused* and *Random* journals.

Monitoring/Evaluation. Pairwise comparisons (Table 1) indicated a significant difference in the frequency of reports of monitoring/evaluation of intervention strategies between *Systematic* participants and *Random* participants, the group that did not receive the problem-solving workshop. The non-pairwise comparison of the *Systematic* and the *Focused* groups with the *Random* group resulted in a higher average mean score (M = 1.99) than the *Random* group for this variable, indicating that participants receiving the problem-solving workshop were more likely to report the monitoring/evaluation of intervention progress than those who did not receive the workshop.

Analysis of journal entries supported the quantitative analysis (Table 1) which pointed to a significant difference between the *Systematic* and the *Random* groups on this variable. For example, one *Systematic* participant wrote: *"J invaded R's self-space six times in 2 1/2 hours. Tuesday morning he was 100% out of others self-space. J had to be reminded three times (with a hand) in the afternoon. Mornings are much better than*

the afternoons. By Friday I didn't remind him once." The journals of those in the *Random* group, when viewed as a whole, discussed problems and interventions but only occasionally provided evidence of monitoring or evaluating student progress. For a majority of the *Random* group journals, monitoring and evaluation of the intervention was not mentioned or was vague in nature. By way of illustration, consider this entry from a *Random* journal: *"Misbehavior continues but at a lesser degree."* The journal analysis did not differentiate the *Systematic* and *Focused* groups on the quality of intervention monitoring/evaluation.

Findings Unique to Systematic Participants Participants from the *Systematic* group, the group that used Systematic Self-Reflection, evidenced three unique patterns in their journal entries. When considered along with other findings, these patterns inform interpretation of problem-solving model application results.

First, *Systematic* participants were the only participants to mention the problem-solving model as a concept or process that influenced their thinking and practice. The following quote from a *Systematic* participant's journal illustrates this point: *"I realized upon reviewing my workshop materials, that my expectations were more than one problem with more than one goal. Next week I need to chose one expectation to focus on."* Another *Systematic* participant wrote *"As I look through my goals I see that I just try to identify the problem or goal and try to be specific as possible. Then I try to think of strategies that might help solve the problem or accomplish the goal."* This phenomenon---recognition and reflection on the problem-solving model---did not occur in journals from either the *Focused* or *Random* groups. The finding was intriguing in that it pointed to the formation of a heuristic or framework by the members of the *Systematic* group. In addition, the finding suggested the beginning of a common language among the *Systematic* participants for discussions of student problems and for intervening in those problems. The emergence of a common language for *Systematic* participants, an important issue, will be considered further.

Second, only *Systematic* participants produced journal entries in which the content was organized via the four components of the problem solving model. For example, one *Systematic* participant recorded:

> *"Problem: Basic sight vocab is poor—little retention...*
> *Goal: To get her to improve basic fluency and sight word recognition*
> *Intervention: She will take home basic sight words to...*
> *Result: She appears to be trying first to get word before automatically asking for help."*

This unique pattern of self-reflection supported the differentiation of *Systematic* participants from *Focused* and *Random* participants on the application of the problem-solving model (Table 1). Moreover, organizing self-reflection by the components of the problem-solving model was strong evidence of the internalization of the problem-solving model as a heuristic for considering interventions for students.

Third, the presence of goal statements forms the pattern unique to *Systematic* journals. This finding clearly mirrored the results of the quantitative analysis in which no other group of participants used goal setting statements of any kind in their post-treatment self-report prompts (see Table 1).

Findings Unique to Focused and Random Participants Two additional findings resulted from the journal analysis. First, *Focused* and *Random* participants frequently described concerns or events that were problems for the teacher and not the student. For example, a *Focused* participant wrote: *"It seems that our school receives less services and materials than the other building. We have a smaller school but does that mean that our computer lab should be lacking? I don't think so."* Similarly, a *Random* participant wrote: *"A female student lacks attention span. What I mean is that she seldom focuses on what is going on. So I find myself always repeating for her benefit or asking her to pay attention. She could do much better if she paid better attention."*

Second, *Focused* and *Random* participants were more likely to see themselves as the intervention. *Focused* and *Random* journals frequently contained entries in which a conference with the teacher or action by the teacher was the intervention chosen. For example, a *Focused* journal contained the following statement: *"B can't*

keep quiet. Blurts out more often. Strategy—tell her I don't like this because...it's her problem to deal with or I will. It worked!" A *Random* participant concerned about a student's inability to complete homework wrote: *"I spoke with him and still he does no homework."* In both representative examples, the intervention did not address the student's skill level or ability to perform in the task.

Intercorrelations of Dependent Variables Table 3 displays Pearson Product-Moment correlations computed among overall scores (n=62) on the dependent variables of the Problem-Solving Model. The four dependent variables were positively correlated. This means that good performance in one aspect of the problem-solving model was significantly related to good performance with each other aspect of the model. Significant correlations revealed an enhanced predictability of goal-setting (r = .58), intervention-selection (r = .58) and monitoring/evaluation (r = .46) when clear problem-identification was present. Importantly, goal-setting was an excellent predictor of accurate intervention-selection (r = .83) and a predictor of monitoring/evaluation (r = .32). The correlations also extended predictability of progress monitoring/evaluation to Intervention-Selection (r = .34).

Table 3
Post-Treatment Intercorrelations Among the Four Dependent Variables of the Problem-Solving Model

Variables	PI	GS	IS	ME
Problem-Identification (PI)	---	.58**	.58**	.46**
Goal-Setting (GS)		---	.83**	.32*
Intervention-Selection (IS)			---	.34**
Monitoring and Evaluation (ME)				---

*p<.05 (two-tailed test) **p<.01 (two-tailed test)

Intercorrelations of Dependent Variables by Treatment Group To further explore the relationship between the dependent variables of the problem-solving model and the level of self-reflection used by each treatment group, Pearson Product-Moment correlations were computed on dependent variables for each treatment group and are displayed in Table 4.

Table 4
Post-Treatment Intercorrelations Among Dependent Variables of the Problem-Solving Model by Treatment Group

Group	Variables	PI	GS	IS	ME
Systematic					
	Problem-Identification (PI)	---	.57**	.52**	.47*
	Goal Setting (GS)		---	.89**	.30
	Intervention-Selection (IS)			---	.18
	Monitoring/Evaluation (ME)				---
Focused					
	Problem-Identification (PI)	---	.13	.12	.16
	Goal Setting (GS)		---	.1387	-.27
	Intervention-Selection (IS)			---	.28
	Monitoring/Evaluation (ME)				---
Random					
	Problem-Identification (PI)	---	.	.29	.49*
	Goal Setting (GS)		---	.	.
	Intervention-Selection (IS)			---	.03
	Monitoring/Evaluation (ME)				---

*p<.05 (two tailed test) **p<.01 (two tailed test)

Correlations indicated that when *Systematic* participants used accurate problem-identification the prediction of performance was enhanced on the remaining three variables: goal-setting (r = .57), intervention-selection (r = .52), and monitoring/evaluation (r = .48). Namely, the better the *Systematic* participants were at identifying a problem, the more likely they were to set a goal, select an intervention that matched that goal, and monitor/evaluate the progress of that intervention. The strongest relationship existed between *Systematic* participants goal-setting (r = .89) and intervention selection, indicating a high predictability for on target interventions once an accurate goal was set.

Results of correlations among the same four dependent variables for the *Focused* group (n=17) revealed no significant relationships at the p<.05 level. For the *Focused* group there was no predictability of performance.

For the *Random* participants (n=20), the correlations indicated a significant relationship between problem-identification and monitoring/evaluation (r = .49) at the .05 level, a somewhat surprising finding, since *Random* participants' performance could be predicted with greater certainty than *Focused* participants who had received the

problem-solving workshop. No significant relationship existed for any of the other variable pairings measured for the *Random* participants. Correlation coefficients could not be computed for the goal-setting variable pairings because there were no *Random* group participants who used a goal setting statement. These results were consistent with the *Random* group mean scores on the goal setting variable (see Table 1) and the analysis of the *Random* group's reflective journals which also revealed that no *Random* participant set a goal for a student.

Teacher Efficacy The second major research question addressed the effects of three levels of reflection----*Systematic, Focused,* and Random---on teacher efficacy investigated through the self-perceptions of efficacy measured by the confidence scale. Separate one-way ANOVAs performed for pre-treatment confidence scale scores did not significantly differentiate the teachers by group $F(2,59) = .2699$, $p = .7652$.

In contrast a one-way ANOVA performed on the post-treatment confidence scale scores yielded significant differences among the three treatment groups, $F(2, 59) = 4.32$, $p < .05$. The follow-up *post hoc* comparisons significantly differentiated the *Systematic* and *Focused* participants from the *Random* participants. The finding indicated that participants who received the problem-solving model workshop perceived their efficacy for selecting interventions for students to be higher than the participants who did not receive the workshop.

A frequency analysis by treatment group was conducted on the confidence scale scores (see Table 5). Three of the four participants from the total sample (n = 62) who chose the highest level of the scale---*Extremely Confident*---were in the *Systematic* group, the group that used Systematic Self-Reflection. The other participant to chose the highest level was in the *Focused* group. Cumulative frequencies revealed that 18 of the 25 participants in the *Systematic* group (72%) chose the two highest levels of the confidence scale as compared with 9 of the 17 *Focused* participants (53%) and 6 of the 20 *Random* participants (30%). In contrast,

none of the participants in the *Systematic* group chose the two lowest levels of the scale---*Extremely Unconfident* and *Unconfident.*

Table 5
Individual Participant Response Frequencies by Treatment Group for Each of the Six Possible Levels of the Confidence Scale

	Treatment Groups							
	Systematic		Focused		Random		Total Sample	
Confidence Scale Levels	*f*	%	*f*	%	*f*	%	*f*	%
EC	3	12.0%	1	5.9%	0	---	4	6.5%
C	15	60.0%	8	47.1%	6	30.0%	29	46.8%
SC	4	16.0%	5	29.4%	9	45.0%	18	29.0%
SU	3	12.0%	2	11.8%	2	10.0%	7	11.3%
U	0	---	1	5.9%	2	10.0%	3	4.8%
EU	0	---	0	---	1	5.0%	1	1.6%
Total	25	100%	17	100%	20	100%	62	100%

EC: Extremely Confident
C: Confident
SC: Somewhat Confident
SU: Somewhat Unconfident
U: Unconfident
EU: Extremely Unconfident
f: frequency of response
% : percentage of treatment group response

Journal Analysis by Treatment Group for Efficacy. Entries in reflective journals were analyzed via the descriptive journal analysis matrix using direct quotes, frequency counts, and intensity judgments. The analysis offered support to the ANOVA results that significantly differentiated the *Systematic* and *Focused* participants, those who received the problem-solving workshop, from those in the *Random* group who did not receive the workshop.

The highest ratio of journals containing positive efficacy statements occurred in the *Systematic* (44%) and *Focused* (41%) groups. Only 15% of the *Random* journals----

the group that did not receive the problem-solving workshop---contained positive efficacy statements. In contrast, statements of negative efficacy occurred in more *Random* journals (40%) than in *Systematic* (12%) or *Focused* (6%) journals. When the journals were examined for the number of positive statements per individual journal, the highest concentration---27 positive efficacy statements---occurred in a single *Systematic* journal. The next highest concentration of positive efficacy statements, 8 in a single journal, occurred in a *Focused* participant's journal. In contrast, when journals were examined for negative efficacy statements the two journals containing the highest concentration were written by *Random* participants, the participants who had not received the problem-solving model workshop. Both the lowest incidence of positive efficacy and the highest incidence of negative efficacy occurred in the *Random* journals in which the reflection was neither focused by a professional development experience or filtered by Systematic Self-Reflection.

Discussion

This paper has argued that respect for the view of teacher as learner not only has merit but offers insights into teacher education practices as well. It suggests that by honoring theoretical underpinnings of the learning process, the precision of teacher reflectivity---an important dimension of teacher expertise---can be both enhanced and engendered. Like all learners, teachers need internal frameworks that allow them to exert metacognitive control over reflections concerning the complex interactions of classroom variables. This exploratory study examined the use of educational language organized as an analytic rubric to provide this cognitive tool.

The study compared the self-reports of teachers relative to their choice of intervention strategies for students. The teachers were encouraged to reflect upon the problem-solving techniques employed to select the intervention strategies. The first group of teachers, the *Systematic* participants, used a rubric defining the problem-solving model to analyze their own self-reports of intervention selection This self-analysis began during a professional development workshop on the problem-solving

model. Their ability to apply the problem-solving model was compared to two other groups of teachers: the *Focused* group, who received the same professional development workshop but not the rubric; and the *Random* group, who received neither the rubric nor the professional development workshop. Results of the comparison seemed to indicate that the rubric, employed the Systematic Self-Reflection process, encouraged *Systematic* participants to develop a more complex relational view of the problem-solving model components. *Systematic* participants exhibited significantly higher levels of problem-solving model application both in their post-treatment self-reports and in their reflective journals. *Systematic* participants were the only group to set goals for their students and then select interventions to match those goals. Furthermore, *Systematic* participants made numerous journal entries in which the problem-solving model was discussed as a concept, and reflective statements were written using the organizational pattern of the problem-solving model. Finally, *Systematic* participants kept reflective journals in which they spoke about their increased levels of confidence and efficacy and chose.

Considering these findings it could be reasoned that the strategic nature of the Systematic Self-Reflection process helped *Systematic* participants move from a simple view of the problem-solving model to a deeper understanding of the relationships among the components of the model: problem-identification, goal-setting, intervention selection, and monitoring/evaluation. As a result of assessing their own self-report statements during the workshop via the self-reflection rubric, *Systematic* participants were provided a comparison of their application of the problem-solving model against the clear set of criteria embedded in the rubric. The self-awareness among *Systematic* participants of their level of application of the problem-solving model began the process of Systematic Self-Reflection and may have positively influenced their efficacy for selecting interventions for students experiencing difficulty in the classroom.

The most striking finding of the study was the emergence of a common language for problem-solving among the *Systematic* practitioners. This contention is

supported by three important findings. First, in their reflective journals and post-treatment self-reports, only *Systematic* participants used the language, organization, and concepts of the problem-solving model indicating the internalization of the model as an heuristic for practice. Second, they were the only treatment group to set goals for their students. Finally, *Systematic* participants were the only treatment group to discuss the effects of the problem-solving model on their thinking and practice. Frameworks for reflective practice that contribute to the emergence of a common language among educators warrant continued study.

The study appears to emphasize the importance of precision in teacher reflectivity. Given the limitations of the present research, future studies should examine the reported problem-solving strategies of teachers in comparison with their actual practice. Also, the process of Systematic Self-Reflection should be examined across a variety of contexts and with participants who are randomly assigned to treatment groups to increase the generalizabilty of the findings.

The exploratory data suggest that to expect the process of self-reflection to produce more expert practitioners the goal of professional development should move beyond encouraging teachers to simply self-reflect. Preferably, professional development should seek to enable teachers to construct and apply heuristics for those reflections that are as sophisticated as the demands of their classrooms. These heuristics should permit teachers to integrate and refine new knowledge, test beliefs they hold about teaching and learning, and continuously refine views of their own practice. The process of Systematic Self-Reflection investigated in this study, seems to offer promise in efforts to design professional development experiences that encourage teachers to evolve as expert problem solvers so that they can better assist their students in becoming the same.

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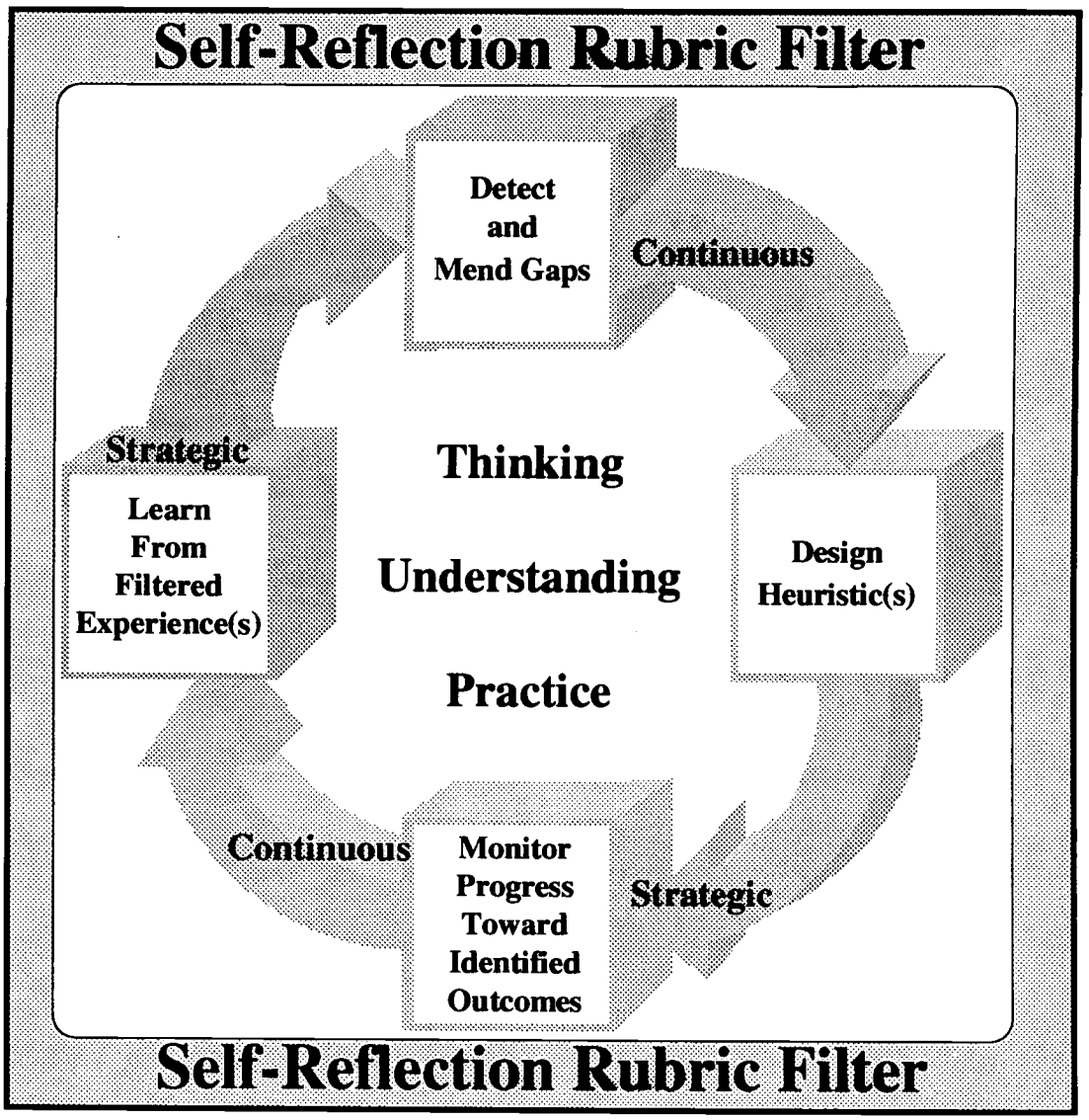

Figure 1. Systematic Self-Reflection Process. The model shows the continuous and strategic process of evaluating thinking, understanding, and practice to detect and mend gaps; design heuristic(s); monitor progress toward identified outcomes; and learn from experience(s) filtered through the process.

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